NETWORKS

An International Journal

VOLUME 44, 2004
NUMBERS 1–4

NETWORKS

An International Journal

EDITORS-IN-CHIEF

Dr. Bruce L. Golden
Robert H. Smith School of Business
Van Munching Hall
University of Maryland
College Park, MD 20742
301-405-2232
bgolden@rhsmith.umd.edu

Dr. Douglas R. Shier
Clemson University
Dept. of Mathematical Sciences
Martin Hall
Box 340975
Clemson, SC 29634-0975
864-656-1100
shierd@clemson.edu

Submit manuscripts to: Dr. Bruce L. Golden, P.O. Box 149, Simpsonville, MD 21150.

ASSOCIATE EDITORS

K. Aardal
R. K. Ahuja
C. Alexopoulos
A. Atamturk
A. Balakrishnan
M. O. Ball
J. E. Beasley
J.-C. Bermond
H. J. Broersma
E. Cheng
C. Colbourn
F. Comellas
U. Derigs
L. Gouveid
J. N. Hagstrom
D. S. Hochbaum
P. Jalliet
R. E. Jamison
M.-Y. Kao
J. Kennington
A. Kershenbaum
S. Khuller
R. Labahn
A. B. Nagurney
S. Olariu
J. B. Orlin
D. Peleg
A. Proskurowski
J. S. Provan
S. Raghavan
R. Ravi
J. Sethuraman
D. Simchi-Levi
C.-P. Teo
P. Toth
G. Woeginger
R. K. Wood

ADVISORY EDITORS

H. Frank
B. Gavish
F. Glover
R. L. Graham
M. Groetschel
S. L. Hakimi
R. Karp
F. T. Leighton
T. Magnanti
C. Monma
W. Pulleyblank

FOUNDING EDITORS

F. T. Boesch, Stevens Institute of Technology
I. T. Frisch, Polytechnic University
D. J. Kleitman, M.I.T.

PAST MANAGING EDITOR

C. L. Suffel, Stevens Institute of Technology

Networks (Print ISSN 0028-3045; Online ISSN 1097-0037 at Wiley InterScience, www.interscience.wiley.com) is published monthly except in February, April, June, and November, two volumes per year, by Wiley Subscription Services, Inc., a Wiley Company, 111 River Street, Hoboken, NJ 07030-5774.

Copyright © 2004 Wiley Periodicals, Inc., a Wiley Company. All rights reserved. No part of this publication may be reproduced in any form or by any means, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the publisher, or authorization through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 750-4470. Periodicals postage paid at Hoboken, NJ, and at additional mailing offices.

The copyright notice appearing at the bottom of the first page of an item in the journal indicates the copyright holder's consent that copies may be made for personal or internal use, or for the personal or internal use of specific clients, on the condition that the copier pay for copying beyond that permitted by Sections 107 and 108 of the United States Copyright Law. The per-copy fee for each item is to be paid through the Copyright Clearance Center, Inc.

This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale. Such permission requests and other permission inquiries should be addressed to the Permissions Department, c/o John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030-5774; (201) 748-6011, fax (201) 748-6008, or visit http://www.wiley.com/go/permissions.

Subscription price (Volumes 45–46, 2005): Print only: $1,690.00 in U.S., $1,770.00 in Canada and Mexico, $1,838.00 outside North America. Electronic only: $1,690.00 worldwide. A combination price of $1,859.00 in U.S., $1,939.00 in Canada and Mexico, $2,007.00 outside North America, includes the subscription in both electronic and print formats. All subscriptions containing a print element, shipped outside U.S., will be sent by air. Payment must be made in U.S. dollars drawn on a U.S. bank. Claims for undelivered copies will be accepted only after the following issue has been delivered. Please enclose a copy of the mailing label. Missing copies will be supplied when losses have been sustained in transit and where reserve stock permits. Please allow four weeks for processing a change of address. For subscription inquiries, please call (201) 748-6645; E-mail: SUBINFO@jwiley.com.

Postmaster: Send address changes to *Networks*, Subscription Distribution, c/o John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030-5774. For subscription inquiries, please call Customer Service at (201) 748-6645 or write to the above address.

Advertising Sales: Inquiries concerning advertising should be forwarded to Advertising Sales Manager, c/o John Wiley & Sons, 111 River Street, Hoboken, NJ 07030-5774, (201) 748-8832. Advertising Sales, European Contacts: Jackie Sibley, c/o John Wiley & Sons, Ltd., The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ England. Tel: 44 1243 770 351; Fax: 44 1243 770 432; e-mail: adsales@wiley.co.uk.

Reprints: Reprint sales and inquiries should be directed to the Customer Service Department, c/o John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030-5774. Tel: (201) 748-8789.

Manuscripts should be submitted to Dr. Bruce L. Golden, P.O. Box 149, Simpsonville, MD 21150. A final version of your accepted manuscript should be submitted on diskette as well as hard copy, using the guidelines for Disk Submission Instructions form usually included in most issues of the journal. **Information for contributors** appears in the first and last issue of each volume. **All other correspondence** should be addressed to: *Networks*, Publisher, c/o John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ, 07030-5774.

The contents of this journal are indexed in the following: *COMPUMATH Citation Index®, CompuScience Computer Abstracts International Database (CAID), a service of Emerald Reviews/Abstracts, Current Contents®/Engineering, Computing and Technology, INSPEC, ISI Alerting Services (includes Research Alert®), MathSciNet/Mathematical Reviews/Current Mathematical Publications, Science Citation Index®, SciSearch® (also known as Science Citation Index-Expanded), Zentralblatt MATH.*

Editorial Production: Lois Polese

This paper meets the requirements of ANSI/NISO 239.48-1992 (Permanence of Paper).

NETWORKS
An International Journal

Author Index to Volume 44, 2004

Agnetis, A., Rossi, F., and Smriglio, S.: An Implicit Enumeration Scheme for the Batch Selection Problem, 151
Ahuja, R. K., Liu, J., Orlin, J. B., Goodstein, J., and Mukherjee, A.: A Neighborhood Search Algorithm for the Combined Through and Fleet Assignment Model with Time Windows, 160
Apollonio, N., Caccetta, L., and Simeone, B.: Cardinality Constrained Path Covering Problems in Grid Graphs, 120
Arbib, C., Smriglio, S., and Servilio, M.: A Competitive Scheduling Problem and Its Relevance to UMTS Channel Assignment, 132

Bai, L., Hearn, D. W., and Lawphongpanich, S.: Decomposition Techniques for the Minimum Toll Revenue Problem, 142
Ben-Ameur, W., and Gouveia, L.: Some Recent Contributions to Network Optimization, 27
Berman, O., and Wang, J.: Probabilistic Location Problems with Discrete Demand Weights, 47

Caccetta, L.: see Apollonio, N.
Caprara, A., and Lodi, A., and Rizzi, R.: On *d*-Threshold Graphs and *d*-Dimensional Bin Packing, 266
Caprara, A., Panconesi, A., and Rizzi, R.: Packing Cuts in Undirected Graphs, 1
Caramia, M., and Dell'Olmo, P.: Bounding Vertex Coloring by Truncated *Multistage* Branch and Bound, 231
Caramia, M., Giordani, S., and Iovanella, A.: Grid Scheduling by On-Line Rectangle Packing, 106
Carello, G., Croce, F. D., Ghirardi, M., and Tadei, R.: Solving the Hub Location Problem in Telecommunication Network Design: A Local Search Approach, 94
Chang, J.-M., and Yang, J.-S., and Wang, Y.-L., and Cheng, Y.: Panconnectivity, Fault-Tolerant Hamiltonicity and Hamiltonian-Connectivity in Alternating Group Graphs, 302
Cheng, Y.: see Chang, J.-M.
Chow, T. Y., and Lin, P. J.: The Ring Grooming Problem, 194
Croce, F. D.: see Carello, G.
Croce, F. D.: see De Giovanni, L.

Dean, B. C.: Algorithms for Minimum-Cost Paths in Time-Dependent Networks with Waiting Policies, 41
De Giovanni, L., Croce, F. D., and Tadei, R.: On the Impact of the Solution Representation for the Internet Protocol Network Design Problem with Max-Hop Constraints, 73
Dejax, P.: see Feillet, D.
Dell'Olmo, P.: see Caramia, M.

Fampa, M. H. C., Klein, S., Protti, F., and Rêgo, D. C. A.: Optimal Grid Representations, 187
Feillet, D., Dejax, P., Gendreau, M., and Gueguen, C.: An Exact Algorithm for the Elementary Shortest Path Problem with Resource Constraints: Application to Some Vehicle Routing Problems, 216
Fischetti, M., Polo, C., and Scantamburlo, M.: A Local Branching Heuristic for Mixed-Integer Programs with 2-Level Variables, with an Application to a Telecommunication Network Design Problem, 61

Gendreau, M.: see Feillet, D.
Ghirardi, M.: see Carello, G.
Giordani, S.: see Caramia, M.
Goemans, M. X.: see Rajasingh, I.
Golden, B. L. and Shier, D. R.: Editorial, III
Goodstein, J.: see Ahuja, R. K.
Gouveia, L., Magnanti, T. L., and Requejo, C.: A 2-Path Approach for Odd-Diameter-Constrained Minimum Spanning and Steiner Trees, 254
Gouveia, L.: see Ben-Ameur, W.
Gueguen, C.: see Feillet, D.

Havet, F., and Wennink, M.: The Push Tree Problem, 281
Hearn, D. W.: see Bai, L.
Hou, X.: see Xu, M.

Iovanella, A.: see Caramia, M.
Iwata, S., and Zuiki, N.: A Network Flow Approach to Cost Allocation for Rooted Trees, 297

Klein, P. N., Krishnan, R., Raghavachari, B., and Ravi, R.: Approximation Algorithms for Finding Low-Degree Subgraphs, 203
Klein, S.: see Fampa, M. H. C.
Krishnan, R.: see Klein, P. N.

Labbé, M., and Yaman, H.: Projecting the Flow Variables for Hub Location Problems, 84
Lawphongpanich, S.: see Bai, L.
Lin, P. J.: see Chow, T. Y.
Liu, J.: see Ahuja, R. K.
Lodi, A.: see Caprara, A.

Macq, J.-F., and Goemans, M. X.: Trade-offs on the Location of the Core Node in a Network, 179
Magnanti, T. L.: see Gouveia, L.
Manuel, P. Macq, J.-F.: see Rajasingh, I.
Mukherjee, A.: see Ahuja, R. K.

Orlin, J. B.: see Ahuja, R. K.

Paletta, G., and Triki, C.: Solving the Asymmetric Traveling Salesman Problem with Periodic Constraints, 31

Pallottino, S. and Tadei, R.: Foreword, 59
Panconesi, A.: see Caprara, A.
Plesník, J.: Minimum k-Geodetically Connected Digraphs, 243
Polo, C.: see Fischetti, M.
Protti, F.: see Fampa, M. H. C.

Quadras, J.: see Rajasingh, I.

Raghavachari, B.: see Klein, P. N.
Rajasingh, I., William, A., Quadras, J., and Manuel, P.: Embedding of Cycles and Wheels into Arbitrary Trees, 173
Ravi, R.: see Klein, P. N.
Rêgo, D. C. A.: see Fampa, M. H. C.
Requejo, C.: see Gouveia, L.
Rizzi, R.: see Caprara, A.
Rossi, F.: see Agnetis, A.

Scantamburlo, M.: see Fischetti, M.
Schaefer, A. J.: see Smith, J. C.
Servilio, M.: see Arbib, C.
Shier D. R.: see Golden B. L.
Simeone, B.: see Apollonio, N.
Smith, J. C., Schaefer, A. J., and Yen, J. W.: A Stochastic Integer Programming Approach to Solving a Synchronous Optical Network Ring Design Problem, 12
Smriglio, S.: see Agnetis, A.
Smriglio, S.: see Arbib, C.

Tadei, R.: see Carello, G.
Tadei, R.: see De Giovanni, L.
Tadei, R.: see Pallottino, S.
Tamir, A.: An Improved Algorithm for the Distance Constrained p-Center Location Problem with Mutual Communication on Tree Networks, 38
Triki, C.: see Paletta, G.

Wang, J.: see Berman, O.
Wang, Y.-L.: see Chang, J.-M.
Wennink, M.: see Havet, F.
William, A.: see Rajasingh, I.

Xu, J.-M.: see Xu, M.
Xu, M., Hou, X., and Xu, J.-M.: The Proof of a Conjecture of Bouabdallah and Sotteau, 292

Yaman, H.: see Labbé, M.
Yang, J.-S.: see Chang, J.-M.
Yen, J. W.: see Smith, J. C.

Zuiki, N.: see Iwata, S.

NETWORKS
An International Journal

Subject Index to Volume 44, 2004

1-median, 179

ADM minimization, 194
Airline scheduling, 160
Algorithms, 120
Alternating group graphs, 302
Approximation, 1
Approximation algorithms, 203
Arrangement graphs, 302
Asymmetric traveling salesman problem, 31

Backbone/tributary network design, 94
Bandwidth, 173
Bicriteria, 179
BLSR, 194
Branch and bound, 151
Branch and bound algorithm, 243

Channel assignment, 132
Chromatic number, 243
Column generation, 216
Combinatorial optimization, 243
Competitive scheduling 132
Complexity, 1, 120
Computational results, 266
Congestion, 173
Congestion pricing, 142
Construction algorithm, 31
Convex game, 297
Core, 297
Core node, 179
Cutting plane method, 142
Cycle, 173

Dantzig-Wolfe decomposition, 142
d-dimensional bin package, 266
Decomposition, 12
Diameter constrained trees, 231, 254
Dicut inequalities, 84
Dilation, 173
Discrete weights, 47

Edge-disjoint cuts, 1
Edge-forwarding index, 292
Egalitarian allocation, 297
Embedding, 173

© 2004 Wiley Periodicals, Inc.

Facility location problems, 61
Fault-tolerance, 302
Fixed interconnection parallel architecture, 173
Fleet assignment, 160
Forwarding index, 292

Graph algorithms, 203
Graph connectivity, 203
Graphs, 27, 120
Grid intersection graph, 187
Grid representation, 187
Grid scheduling, 106
Grids, 120

Hamiltonian, 302
Hamiltonian-connected, 302
Heuristic, 61, 243
Hop-constrained shortest paths, 73
Hop-indexed models, 231, 254
Hub location, 84, 94

ILP formulations, 151
Improvement procedure, 31
Independent set, 1
Information distribution, 281
Integer programming, 160, 187
Interconnection networks, 302
Intersection graph of segments, 187

Lagrangian relaxation, 132
Linear programming relaxation, 1
Local search, 94
Location, 47
Logistic networks, 151
Lower bound, 243, 266
L-shaped method, 12

Mathematical programming, 27
Maximum matching, 266
Maximum stable set, 266
Median, 47
Minimax, 47
Minimum-degree, 203
Mixed-integer programs, 61
Multicast communication, 179
Multifacility location, 38

Neighborhood search, 160
Network design, 12, 27, 203, 281
Network flows, 231, 254

Network optimization, 27
Networks, 47, 160
Nonlinear knapsack, 151
NP-hard problems, 203
Nucleolus, 297

On-line algorithms, 106
OSPF routing, 73

Packing, 1
Panconnected, 302
Pancyclic, 302
Parameterized complexity, 194
Path Covering, 120
p-center, 38
Periodic constraints, 31
Polyhedral analysis, 84
Pricing, 27
Probabilistic weights, 47
Projection, 84

Rectangle packing, 106
Reliability, 27
Ring loading, 194
Routing, 27, 292

Shortest path, 41, 216
Solution representation, 73
SONET, 12
SONET over WDM, 194
Steiner tree, 179, 281
Stochastic integer programming, 12
Subgraphs, 203
Survivability, 27

Telecommunication network design, 73, 94
Threshold graph, 266
Time-dependent networks, 41
Time-varying networks, 41
Traffic grooming, 194
Tree Network, 38, 297
Trees, 27

UMTS, 132
Uncertainty, 27

Vehicle routing, 216
Vertex-forwarding index, 292

Waiting, 41
Wireless communications, 27
Worst case analysis of heuristics, 281